

## CLAIMS

1           1. Fuel cell, which is provided with a plurality of capillary tubes, each of  
2    which has an electrode and through and/or against which a fuel component flows,  
3    characterized by the fact  
4            -- that the capillary tubes (34) are arranged in bundles in adjacent segments  
5    (35-40), with each bundle being located within a reaction chamber (68, 69),  
6            -- that the electrode (41) is led out at both ends of each capillary tube,  
7            -- that the electrodes (41) of the capillary tubes (34) of a segment (35-40) are  
8    electrically connected at both ends at essentially the same potential, and  
9            -- that at least one wall section 45 of each segment (35-40) is provided with a  
10   counterelectrode (46/47) or at least partially forms the counterelectrode.

1           2. Fuel cell in accordance with Claim 1, characterized by the fact that the  
2    segments (35-40) are circular segments.

1           3. Fuel cell in accordance with one or more of the preceding claims,  
2    characterized by the fact that the electrodes (10) of the capillary tubes (8) of a segment (3, 5,  
3    7) are connected counter to the counterelectrode (13, 15, 17) of an adjacent segment (2, 4, 6).

1           4. Fuel cell in accordance with one or more of Claims 1 and 2, characterized  
2    by the fact that the electrodes (41) of all the capillary tubes (34) of a fuel cell (30) are  
3    connected together at the ends.

1               5. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the connection can be preset by a switch.

1               6. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that each segment (2-7) has its own walls (13-18).

1               7. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that two spaced separating walls (19, 20; 107, 108) are formed  
3 between two adjacent segments (5, 6; 100, 101).

1               8. Fuel cell in accordance with one or more of preceding Claims 1 to 5,  
2 characterized by the fact that adjacent segments (35-40) have a common separating wall (45).

3               9. Fuel cell in accordance with one or more of the preceding claims,  
4 characterized by the fact that separating walls (19, 20; 107, 108) are constructed without a  
5 tight seal.

1               10. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that a separating wall has at least one separately constructed  
3 counterelectrode.

1               11. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that a common separating wall (45) of two adjacent segments (35-  
3 40) has a counterelectrode (46, 47) on both sides.

1                   12. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that a counterelectrode (46) has a support sheet (48) and that the  
3 support sheet (48) is covered with a lattice-like mount (49) for a catalyst.

1                   13. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that a capillary tube has a lattice-like core, which is covered with a  
3 catalyst and is annularly surrounded by a membrane.

1                   14. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the core, the support sheet, and/or the lattice-like mount is made  
3 of titanium.

1                   15. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the capillary tubes (8, 34) are open at the ends and a gas has free  
3 access to flow through them.

1                   16. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that air flows through the capillary tubes (34) and that a pressure  
3 chamber (60) is formed by a housing (81) at one end of the capillary tubes (34), which  
4 terminate with their open ends in the pressure chamber (60), into which atmospheric air is  
5 admitted by means of a ventilator (61).

1                   17. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that a common, closed-end feed line (66) for a fuel component is  
3 provided between adjacent angles of segments and that the feed line (66) is provided with  
4 openings (67) through which the fuel component can enter the reaction chambers (68, 69) of  
5 the segments.

1                   18. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that an exhaust gas line (84) is provided, which, in reaction  
3 chambers (68, 69) of the segments, has openings (85) that admit a gaseous combustion  
4 product and opens outside the fuel cell (30).

1                   19. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the exhaust gas line (84) is a continuation of the feed line (66).

1                   20. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that at least one pump (72, 73) is connected to the feed line (66) and  
3 that the pump (72, 73) is installed in a pump chamber (75) of a housing (64) at the opposite  
4 end of the fuel cell from the pressure chamber (60).

1                   21. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the fuel component is a fuel mixture, that individual  
3 components of the fuel mixture are each fed into the feed line (66) by an automatically  
4 controlled pump (72, 73), and that a control system automatically controls the pumps (72, 73)

5 to provide optimum adjustment of the proportions of the individual components in the fuel  
6 mixture.

1 22. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the fuel mixture contains water and methanol as its individual  
3 components.

1 23. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the fuel cell (30) is designed for operation with vertically rising  
3 capillary tubes (34) and with a pressure chamber (60) at the top.

1 24. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that a liquid phase emerging from the capillary tubes (34) is  
3 collected in a collecting chamber (62) at the lower end.

1 25. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the liquid phase is water, which is returned to the combustion  
3 process.

1 26. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the reaction chambers (68, 69) are filled with acidic methanol  
3 (70, 71).

1                   27. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the level of filling of the reaction chambers (68, 69) is  
3 monitored with level sensors (91-93).

1                   28. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by a free space (82, 83) above the acidic methanol.

1                   29. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that, if the filling level is too high or too low, the combustion  
3 process is stopped.

1                   30. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the segments (35-40) are arranged inside a cylindrical housing  
3 (31) and that the housing (31) is sealed at the axial ends by cover plates (54, 55) through  
4 which the capillary tubes (34) pass.

1                   31. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the cover plates (21, 22) grip the arrangement of the separating  
3 walls (19, 20) of the sectors (2-7) and are likewise provided with separating webs (23, 24)  
4 and that a panel (25) that encloses the capillary tubes (8) of the sector (5) below it is mounted  
5 between the separating webs (23, 24).

1                   32. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that electrical connections (52, 53) of the counterelectrodes (46, 47)  
3 are led out through the cover plates (54, 55).

1                   33. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the cover plates (54, 55) have grooves (56, 57) for holding the  
3 separating walls (45) and that the grooves (56, 57) are located on the sides of the cover plates  
4 (54, 55) that axially terminate the reactions chambers.

1                   34. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that both ends of the separating wall (43, 44) have a projecting  
3 connector (58, 58; 59, 59), which is provided with an extension [50, 51] of the support sheet  
4 [48], and that the connectors pass through the cover plates (54, 55) that close the housing (31)  
5 at the axial ends.

1                   35. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the housing (31) is closed at each axial end by two cover plates  
3 (54, 93; 55, 94).

1                   36. Fuel cell in accordance with one or more of the preceding claims,  
2 characterized by the fact that the housing (31) is provided with flanges (32, 33) for attaching  
3 the pressure chamber housing (81) and the chambers (62, 75, 76, 77) located at the opposite  
4 end of the fuel cell.